

WHAT IS CLAIMED IS:

- 1 1. A mechanically formed vortex ultrasound transducer capable of
2 producing at least one, substantially annular focal region(s) when said transducer is excited.
- 1 2. The transducer of claim 1 where the transducer incorporates a solid
2 piezoelectric material.
- 1 3. The transducer of claim 1 where the transducer incorporates a
2 composite piezoelectric material.
- 1 4. The transducer of claim 1 where the transducer incorporates one or
2 more matching layers.
- 1 5. The transducer of claim 1 where the transducer incorporates a filler
2 material in front of the transducer or backing material in back of the transducer.
- 1 6. The transducer of claim 1, being formed of a single contiguous
2 piezoelectric element.
- 1 7. A mechanically formed ultrasound transducer comprising a plurality of
2 piezoelectric elements suspended in a polymer and having an irregular shape such that a
3 vortex focal field is produced when the transducer is excited.
- 1 8. A polymer for use in the creation of a heat set transducer shape having
2 a liquid state when introduced into a diced piezoelectric ceramic, a semi solid state during
3 processing and a fixed solid state upon completion of a heat treatment step.
- 1 9. The polymer of claim 8, wherein the polymer is an epoxy.
- 1 10. A system for producing a vortex ultrasound focal field comprising:
2 a mechanically formed ultrasound transducer having an irregular shape for
3 creating said vortex; and
4 an activation switch.
- 1 11. A method of creating a vortex transducer comprising the steps of:
2 (a) shaping a piezoelectric ceramic into a desired form, the form having a
3 front end and a back end;

4 (b) dicing said front end create a plurality of elements, said elements being
5 attached to said back end and separated by dicing channels;
6 (c) filling said dicing channels with an epoxy material and allowing said
7 epoxy to gel;
8 (d) creating a transducer form by removing said back end such that said
9 elements are separated from one another;
10 (e) pressing said transducer form into a mold and heating said transducer
11 form such that the epoxy is heated above the B-stage and allowing the resin to cross link and
12 cool in a set shape;
13 (f) treating at least one surface of the transducer form with a conductive
14 material such that all elements are in contact with said conductive material; and
15 (g) making a shape irregularity in the transducer form such that the
16 transducer will produce a vortex effect.

1 12. The method of claim 11, wherein step (g) may be performed before
2 performing any one of steps (a)-(f).